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IMPLEMENTATION OF HOME SECURITY SYSTEM USING ARDUINO

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Abstract : This study aimed to examine **"HOME SECURITY ALRAM USING PIR ARDUINO"**,This project focuses on creating a home security alarm using a PIR sensor and Arduino specifically designed for nighttime use. The system activates a security light only when it's dark and movement is detected. Both the lamp and buzzer are triggered when darkness and movement are detected simultaneously. However, when there is sufficient light, the lamp turns off regardless of any detected motion. Motion detection has consistently played a crucial role in various projects, and the PIR sensor simplifies the process of detecting human or animal movement effectively. When there's light, the lamp is turned off, Even when motion is detected. Detecting motions or movements has Always been important in most projects. With the help of the PIR Sensor it has become very easy to detect human/animal movement. The vulnerability of conventional home security systems has been threatened by the rapid growth of robbery and burglary over the last couple of years. In our everyday lives, automation and security have risen to the top of the list of concerns. Modern hardware and home automation are now dealt with in a standard manner. By combining novel planning methodologies, we have attempted to patch up these principles in this paper. For both domestic and contemporary reasons, we have included a cost-effective computerized security framework in this case. The highest possible standards of safety are continually appealing to everyone. The equipment circuit design enables each customer to connect this home security system to a distant network using a piezoelectric buzzer, an LCD board, and a PIR sensor at residences and workplaces. The 16bit Arduino UNO microcontroller serves as sole constraint for the framework. Various types of connection point circuits are used to connect each sensor and finder to the microcontroller chip. The chip in the microcontroller will continuously control each sensor. If the micro controller detects any safety risk, it will send a signal to the associated buzzer, which will then turn on.

IndexTerms **- PIR Sensor, Home Security, Arduino, Motion Detection, Alarm.**

I. INTRODUCTION

Home security remains a top priority for homeowners in today's world. Addressing this vital need, a simple, yet effective home security alarm system can be devised using an Arduino microcontroller and a Passive Infrared (PIR) sensor. Renowned for their efficiency in motion detection, PIR sensors excel in recognizing changes in infrared radiation, thus making them perfectly suited for monitoring movement within designated areas. Coupling a PIR sensor with an Arduino paves the way for a robust, customizable, and cost-efficient home security apparatus.This innovative approach to home security serves as both a deterrent to potential intruders and a reliable source of alerts for homeowners, ensuring prompt awareness of any unauthorized entries or activities within the premises. The strategic placement of the PIR sensor is key, targeting areas prone to unauthorized access. Upon detecting motion, the sensor activates the security system, which can range from sounding alarms and activating surveillance cameras to notifying homeowners or security services.

Delving deeper into the combination of Arduino and PIR sensors in a home security context reveals a multitude of practical applications and potential enhancements. The Arduino's compatibility with various sensors and modules, coupled with its programmability, opens up a world of customization for the security system. Users can tailor the Arduino's response to motion detection in numerous ways, such as triggering alarms, sending smartphone notifications, or seamlessly integrating with existing smart home infrastructure for a more sophisticated response. The PIR sensor is indispensable in this setup, prized for its high sensitivity and low power consumption. It works by detecting infrared light emitted by living beings.

Responding to significant alterations in the infrared patterns it monitors. This quality enables it to effectively identify any unauthorized presence, thus bolstering the security of the area under surveillance. Another significant advantage of utilizing Arduino in home security systems is the educational opportunity it presents. Engaging with such a project offers practical experience in electronics and programming, skills that are increasingly valuable in today's tech-oriented world. It also connects users to a wider community of makers, fostering a collaborative environment where knowledge and innovative ideas are exchanged. Moreover, the flexibility of this system allows for further expansion and modification to suit specific needs. Additional components, such as door/window sensors, smoke detectors, or glass break sensors, can be integrated for a more all-encompassing security setup. For those with advanced technical skills, the system can be upgraded to include networking features, enabling internet connectivity for

real-time monitoring and remote control. In summary, creating a home security system using Arduino and PIR sensors not only enhances the safety and peace of mind of homeowners but also offers a customizable, expandable, and educational route into the realm of modern home security solutions.

II. .LITERATURE SURVEY

The Arduino, acting as the brain of our home alarm system, a study said by Andriansyah, Miftah, et al study says that **[1] ,** works together with a PIR (Passive Infrared) sensor to keep our home safe.Think of the Arduino as a diligent security guard stationed inside your house. This guard is equipped with a special pair of glasses – the PIR sensor. Unlike regular glasses, these allow the guard to "see" heat signatures, particularly changes in infrared radiation that occur when someone or something moves.

To get our security guard ready for duty, Sarhan, et al**[2]** study says that we first need to set up his equipment. This process is like giving him a set of instructions at the beginning of his shift (the void setup() function in the Arduino's programming). In these instructions, we tell our guard which tool to use for observing (assigning Pin 2 on the Arduino to the PIR sensor) and how to sound the alarm (connecting Pin 3 to an LED light or a buzzer).

Once the setup is complete, our guard enters a constant state of vigilance (represented by the loop() function in the program).explained by Nayyar, et al **[3]** his main task is straightforward yet crucial: keep an eye on his surroundings through the PIR sensor glasses. The moment these glasses detect a change in heat movement - like someone walking into the room - the sensor sends a signal to the Arduino (Pin 2 goes high).

Upon receiving this signal, our guard reacts swiftly. Suresh, S., et al **[4]** uses his alarm tool (the LED light or buzzer connected to Pin 3) to create a visible or audible alert. He does this by turning the alarm on and off in quick succession - flashing a light or buzzing - which is noticeable and draws attention. This pattern continues for a brief period (induced by a short delay in the program), ensuring the alert is unmistakable and immediate.

This cycle of detecting movement and triggering as per Surantha, et al **[5]** paper, an alarm repeats as long as the Arduino is powered on. Essentially, our little electronic guard is tirelessly working, constantly scanning the environment for any signs of intrusion, and ready to alert us at a moment's notice.

The beauty of this system lies in its simplicity and efficiency. With just a few components and a straightforward program, we have a reliable and responsive security system. It's a perfect example of how technology can be harnessed to enhance our safety and peace of mind in our homes.

The objective of this project is to develop and deploy a home security alarm system capable of detecting intruders or unauthorized movements within a predefined area and subsequently triggering an alarm to notify homeowners or security personnel. The primary components of this project include:

PIR Sensor: A PIR sensor will be used to detect motion within the Designated area. When it senses movement, it generates a signal that Will be processed by the Arduino.

Arduino Microcontroller: The Arduino will serve as the brain of the System, receiving input from the PIR sensor and controlling the alarm Output. It will also allow for customization and flexibility in defining Alarm triggers.

Alarm Output: An audible or visual alarm will be activated when the PIR sensor detects motion, alerting homeowners to potential intruders.

Customization: The system will provide the flexibility to adjust Sensitivity levels, time delays, and alarm types to suit specific security Needs.

Arduino Board: Acts as the central processing unit of the alarm system. A model like Arduino Uno is suitable for its ease of use and compatibility.

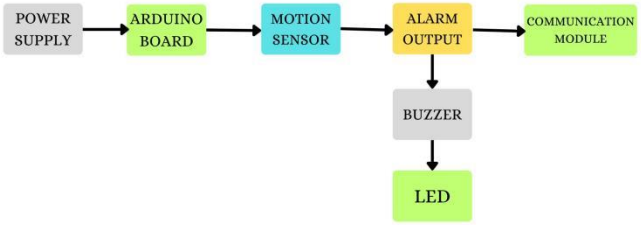


FIG.1 - BLOCK DIAGRAM

PIR Sensor: Detects motion through changes in infrared radiation in its field of view.

Output Devices: An LED light and a buzzer are used for visual and audio alerts.

Connecting Wires: Facilitate connections between the Arduino, sensor, and output devices.

Power Supply: Typically a USB cable for the Arduino and appropriate batteries for the PIR sensor.

The PIR sensor is linked to the digital input pin (Pin 2) of the Arduino, which is set up to interpret the sensor's output signals. Meanwhile, both the LED and buzzer are connected to a digital output pin (Pin 3) on the Arduino for activation purposes. They serve as the indicators for motion detection. Ground and power connections are established from the Arduino to the PIR sensor, LED, and buzzer. The Arduino is programmed using the Arduino IDE (Integrated Development Environment).
In the setup() function, Pin 2 is set as an input to receive signals from the PIR sensor, and Pin 3 is set as an output to control the LED and buzzer. The loop() function continuously checks the state of Pin 2. When motion is detected (Pin 2 goes high), the Arduino activates Pin 3, turning on the LED and buzzer, typically in a flashing or beeping pattern to draw attention.

After assembly and programming, the system is thoroughly tested. This involves checking the sensitivity and range of the PIR sensor and ensuring the LED and buzzer activate correctly upon detection of motion. Once tested, the system is installed in a strategic location, such as near entry points of a home. The height and angle of the PIR sensor are adjusted for optimal coverage. Final tests are conducted to ensure the system operates effectively in its designated environment.

In summary, this methodology integrates hardware assembly with software programming to create a functional home security alarm. The simplicity of the design and the use of readily available components make this an accessible project for individuals looking to enhance their home security. Furthermore, this approach offers customization options, allowing users to adapt the system to specific requirements, such as adding more sensors or integrating with other home automation systems. With careful planning and execution, this DIY project can provide an effective and economical solution for improving home safe

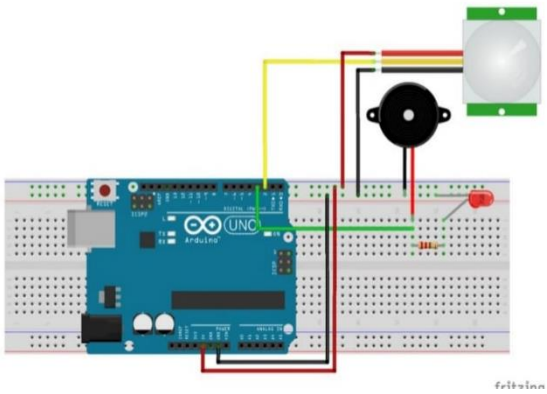


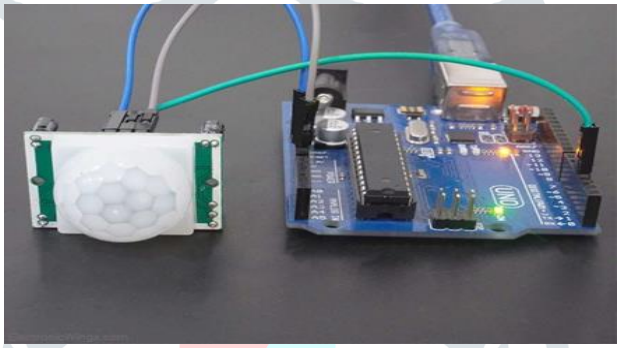
FIG.2- CIRCUIT CONNECTION

The orange-colored potentiometers are utilized to adjust the sensitivity and trigger-on time of the sensor. Positioned between the Vcc and Gnd pins, the Dout pin of the sensor operates within a range of 3.3V, although it can be powered with 5V. Additionally, there is a trigger pin setup at the top left corner, offering two operational modes: "H" and "I".

In "H" mode, the Dout pin transitions to a high state (3.3V) upon detecting a person within range, remaining high for a specified duration set by the potentiometer. Regardless of the person's presence within the area, the output pin remains high until the set time elapses. Our project utilizes this module in "H" mode.

FIG.3 – RESULT

In "I" mode, the output pin Dout will transition to a high state (3.3V) upon detecting a person within range and will remain high as long as the person stays within the limit of the sensor's range.



Once the person has left the area, the pin will transition to a low state after a particular time, which can be adjusted using the potentiometer.

III. RESULTS AND DISCUSSION

The provided image illustrates the circuit diagram for an Arduino motion detector project involving interfacing with a PIR module and activating an LED/Buzzer.

The PIR sensor is powered by the Arduino's 5V rail. Its output pin is linked to the 2nd digital pin of the Arduino, serving as the input pin. Subsequently, the 3rd pin of the Arduino is connected to both the LED and Buzzer, functioning as the output pin.

The Arduino is programmed to trigger an output on the 3rd pin upon detecting input on the 2nd pin. Following discussion of the circuit and program, power on the Arduino and allow 50-60 seconds for PIR sensor calibration. During this period, disregard any output. Subsequently, test the system by moving in front of the PIR sensor; the LED/Buzzer should activate. The beeping/flashing should cease after some time. You can adjust sensitivity or duration by manipulating the potentiometer. If you encounter difficulties, seek assistance through the comment section or forums.

FUTURE SCOPE

The future scope for home security sensors using Arduino includes integrating advanced AI algorithms for intelligent threat detection, enhancing communication protocols for seamless connectivity, and exploring energy-efficient solutions for sustainability. Additionally, the integration of smart home platforms and the development of user-friendly mobile applications will play a pivotal role in expanding the capabilities and user adoption of Arduino-based home security systems.

CONCLUSION

Creating A home security alarm system utilizing a PIR (Passive Infrared) sensor and Arduino presents a practical and cost-effective means to bolster home security. The PIR sensor detects motion within its range, prompting the Arduino to either activate an alarm or send notifications, thus enhancing the overall security measures of the home. This DIY Project offers flexibility and customization

options, allowing Users to adapt it to their specific needs. By implementing this system, you can achieve increased peace Of mind knowing that you have an extra layer of security. Additionally, it serves as an excellent Educational opportunity to learn about sensor technology, Microcontroller programming, and home automation. However, it's essential to consider factors like false alarms due To pets or environmental conditions and ensure that the system Is reliable and robust. Regular maintenance and testing are Necessary to keep it functioning effectively. Overall, a PIR Sensor-based home security alarm with Arduino is a valuable Addition to any home security strategy when designed and Maintained thoughtfully.

REFERENCES

1. Andriansyah, Miftah, et al. "E-KTP as the basis of home security system using arduino UNO." 2017 4th International Conference on Computer Applications and Information Processing Technology (CAIPT). IEEE, 2017.

2. Sarhan, Qusay I. "Systematic survey on smart home safety and security systems using the Arduino platform." IEEE Access 8 (2020): 128362-128384.

3. Nayyar, Chetana, B. Valarmathi, and K. Santhi. "Home security and energy efficient home automation system using arduino." 2017 International Conference on Communication and Signal Processing (ICCSP). IEEE, 2017.

4. Surantha, Nico, and Wingky R. Wicaksono. "Design of smart home security system using object recognition and PIR sensor." Procedia computer science 135 (2018): 465-472.

5. Suresh, S., et al. "Home monitoring and security system." 2016 International conference on ICT in business industry & government (ICTBIG). IEEE, 2016.

6. Zaman, Hasan U., et al. "Low cost multi-level home security system for developing countries." 2017 International Conference on Intelligent Computing and Control Systems (ICICCS). IEEE, 2017.